US007042164B2

(12) United States Patent
Yazawa

(10) Patent No.: US 7,042,164 B2
(45) Date of Patent: May 9, 2006

(54) **SELF LIGHT EMITTING DISPLAY DEVICE**

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(73) Assignee: **Tohoku Pioneer Corporation**, Yamagata (JP)

( * ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/983,720**

(22) Filed: **Nov. 9, 2004**

(65) **Prior Publication Data**

US 2005/0116655 A1 Jun. 2, 2005

(30) **Foreign Application Priority Data**

Nov. 28, 2003 (JP) ............................ 2003-399125

(51) **Int. Cl.**
*G03B 15/03* (2006.01)

(52) **U.S. Cl.** .................... **315/169.3**; 315/224; 345/211

(58) **Field of Classification Search** ............. 315/169.3, 315/224, 160; 345/211–212
See application file for complete search history.

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(57) **ABSTRACT**

In order to realize, at a low cost, the function of an indicator which is brought to a light emitting state during a wait state, a panel **1** as a display section is constituted by self light emitting elements E**11**–Enm for example by organic EL elements, and organic EL elements which function as the indicator Ei which is brought to the light emitting state during the wait state are also formed on the same panel. Meanwhile, an indicator drive circuit **13** which drives and allows the organic EL elements that function as the indicator Ei to emit light is constructed by one chip IC together with the data driver **2**. By forming the indicator drive circuit **13** as one chip IC in a data driver **2**, the manufacturing cost can be reduced compared to the case where the indicator drive circuit is prepared separately. The EL elements functioning as the indicator Ei also can be formed on the same substrate as that of the respective EL elements E**11**–Enm constituting the display section by the same process, thereby contributing to cost reduction.

**9 Claims, 6 Drawing Sheets**

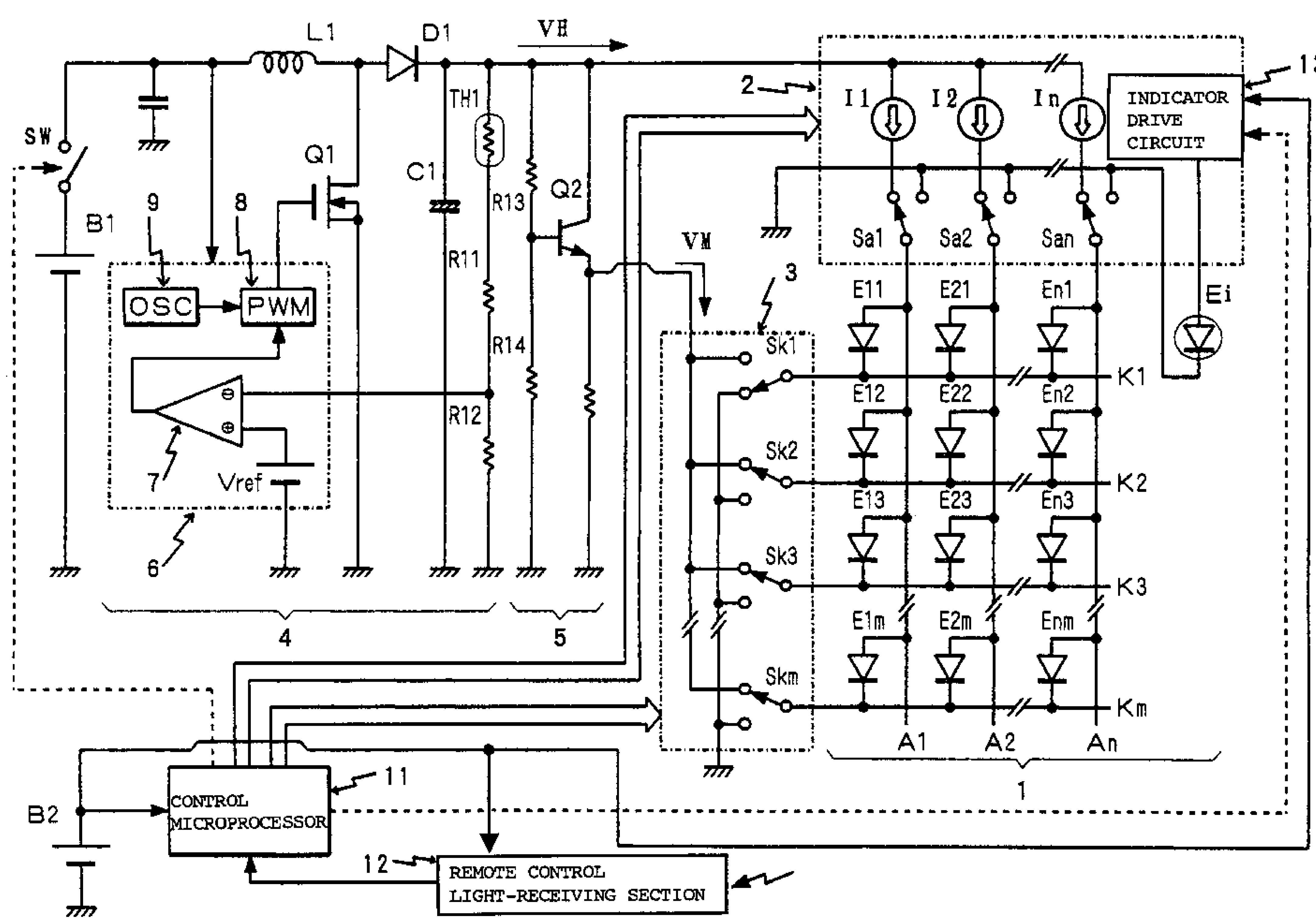


FIG.1

(Prior Art)

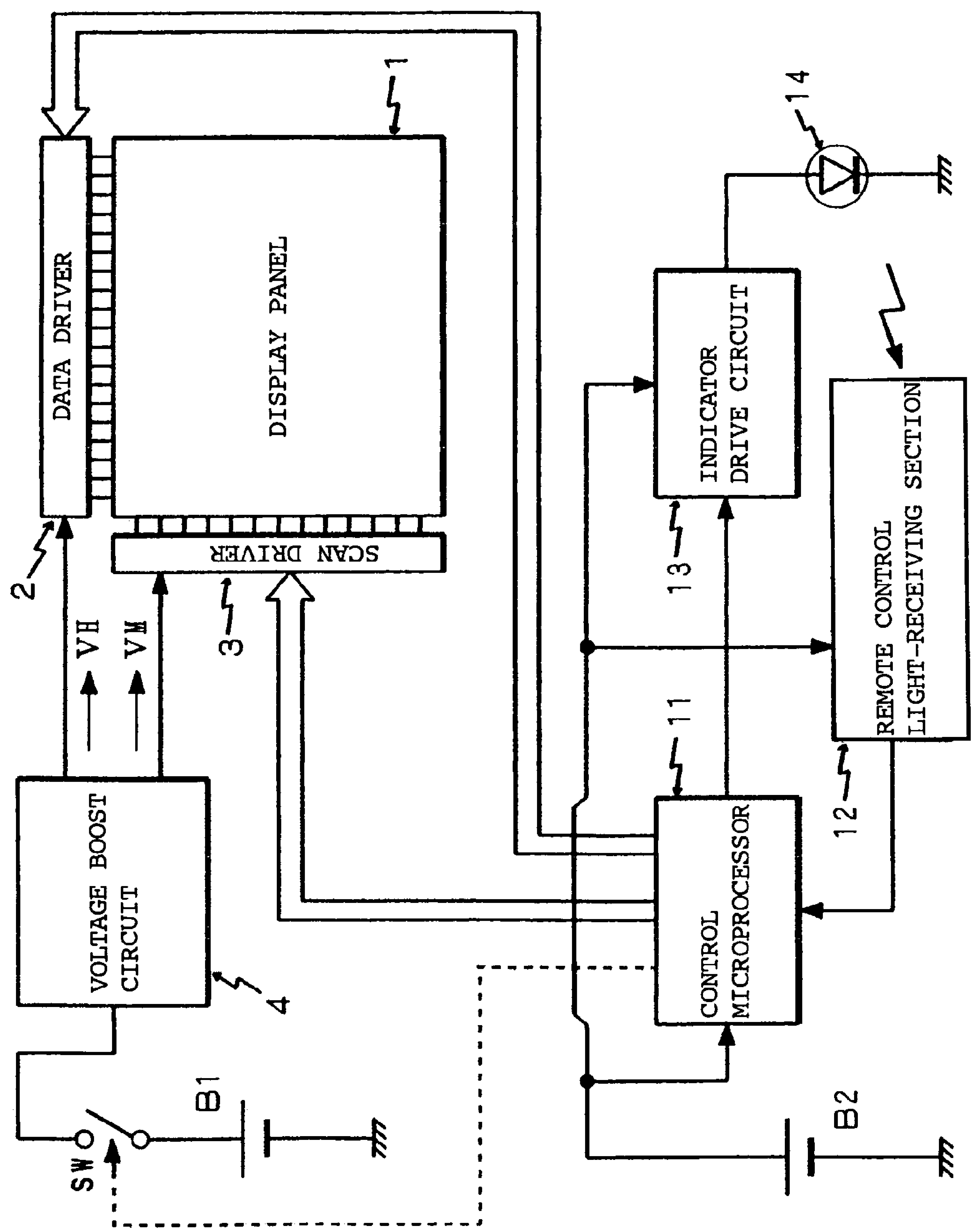
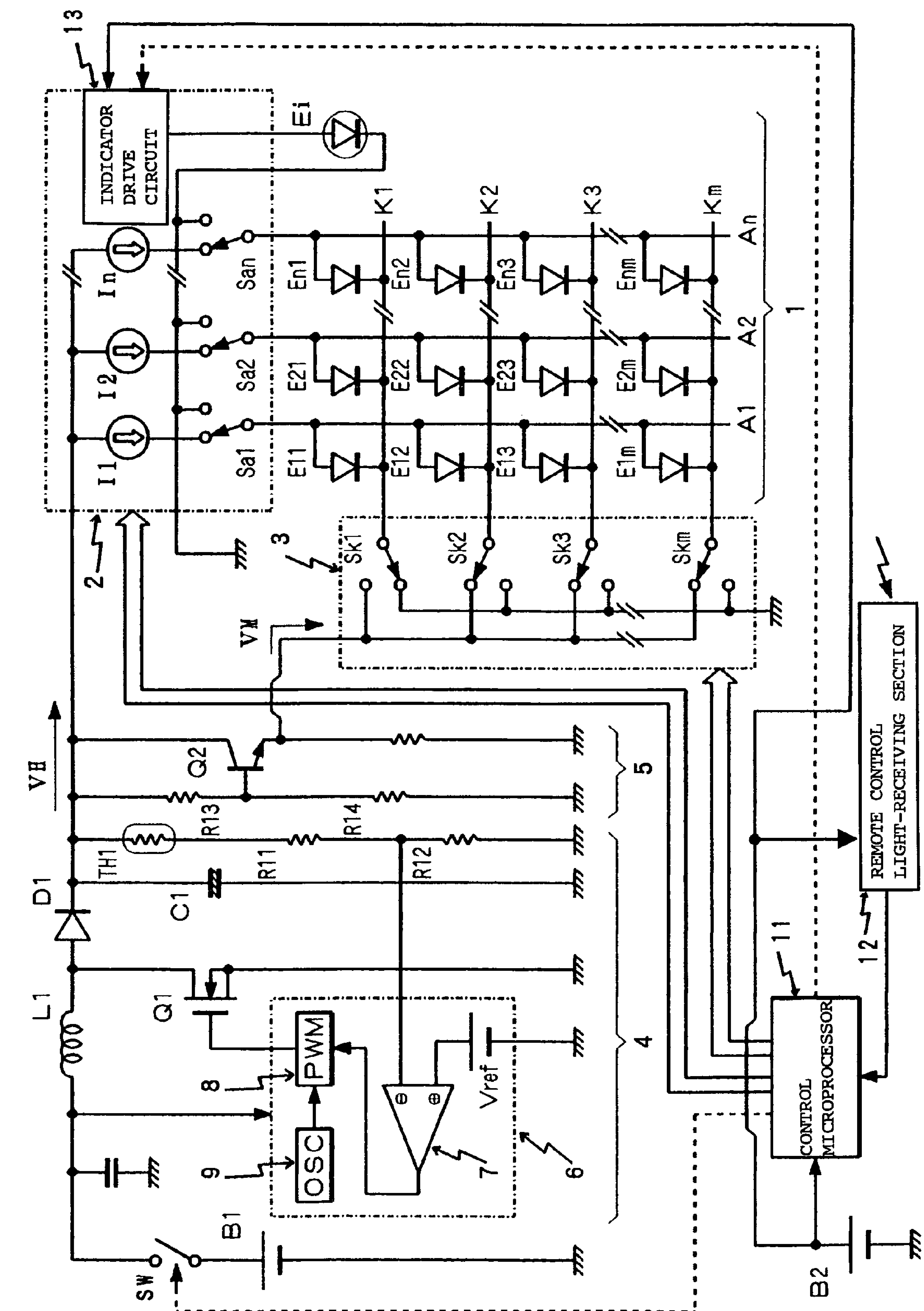


FIG.2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REMOTE CONTROL LIGHT-RECEIVING SECTION
CONTROL MICROPROCESSOR
PWM
OSC
Vref
VH
VM
SW
B1
B2
L1
Q1
Q2
D1
C1
TH1
R11
R12
R13
R14
Ei
I1
I2
In
Sa1
Sa2
San
Sk1
Sk2
Sk3
Skm
K1
K2
K3
Km
A1
A2
An
E11
E12
E13
E1m
E21
E22
E23
E2m
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Enm
1
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3
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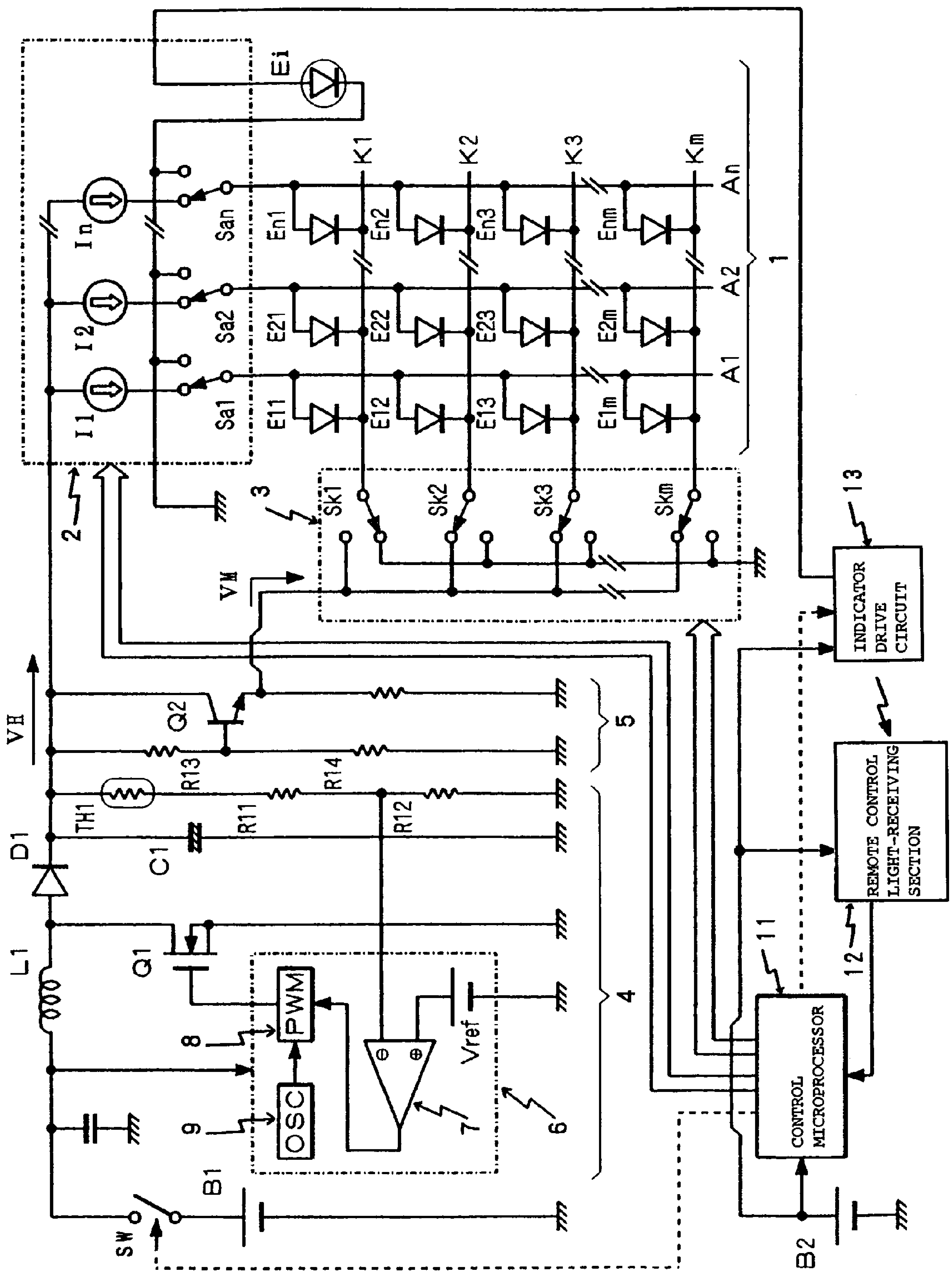
9
11
12
13

FIG.3


INDICATOR DRIVE CIRCUIT
REMOTE CONTROL LIGHT-RECEIVING SECTION
CONTROL MICROPROCESSOR
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Ei
Q1
Q2
D1
L1
C1
TH1
R11
R12
R13
R14
SW
B1
B2
I1
I2
In
Sa1
Sa2
San
Sk1
Sk2
Sk3
Skm
K1
K2
K3
Km
A1
A2
An
E11
E12
E13
E1m
E21
E22
E23
E2m
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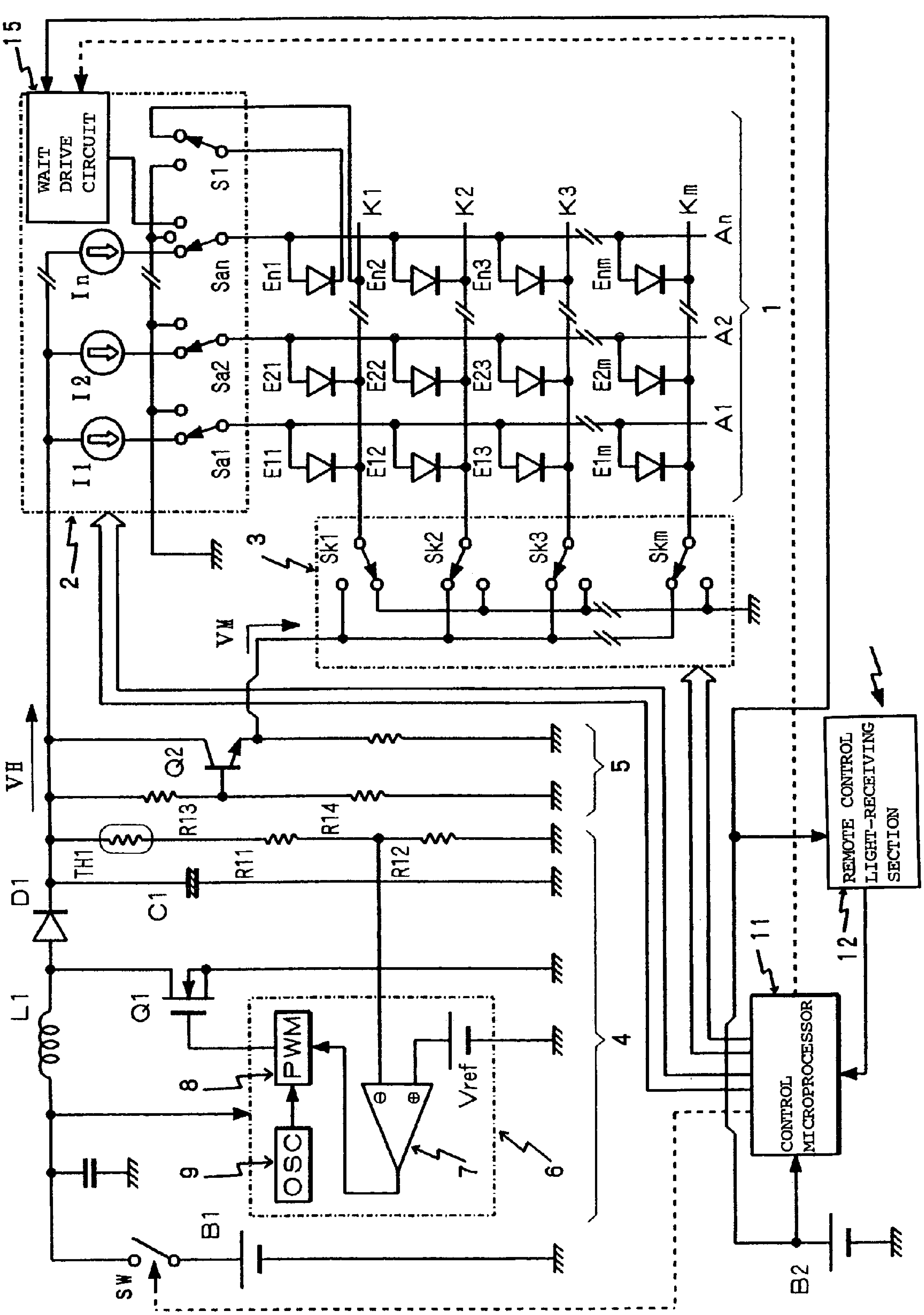
13

FIG.4


WAIT DRIVE CIRCUIT
15
2
3
1
4
5
6
7
8
9
11
12
S1
San
Sa2
Sa1
In
I2
I1
K1
K2
K3
Km
An
A2
A1
En1
En2
En3
Enm
E21
E22
E23
E2m
E11
E12
E13
E1m
Sk1
Sk2
Sk3
Skm
VM
VH
Q2
Q1
R13
R14
R11
R12
TH1
C1
D1
L1
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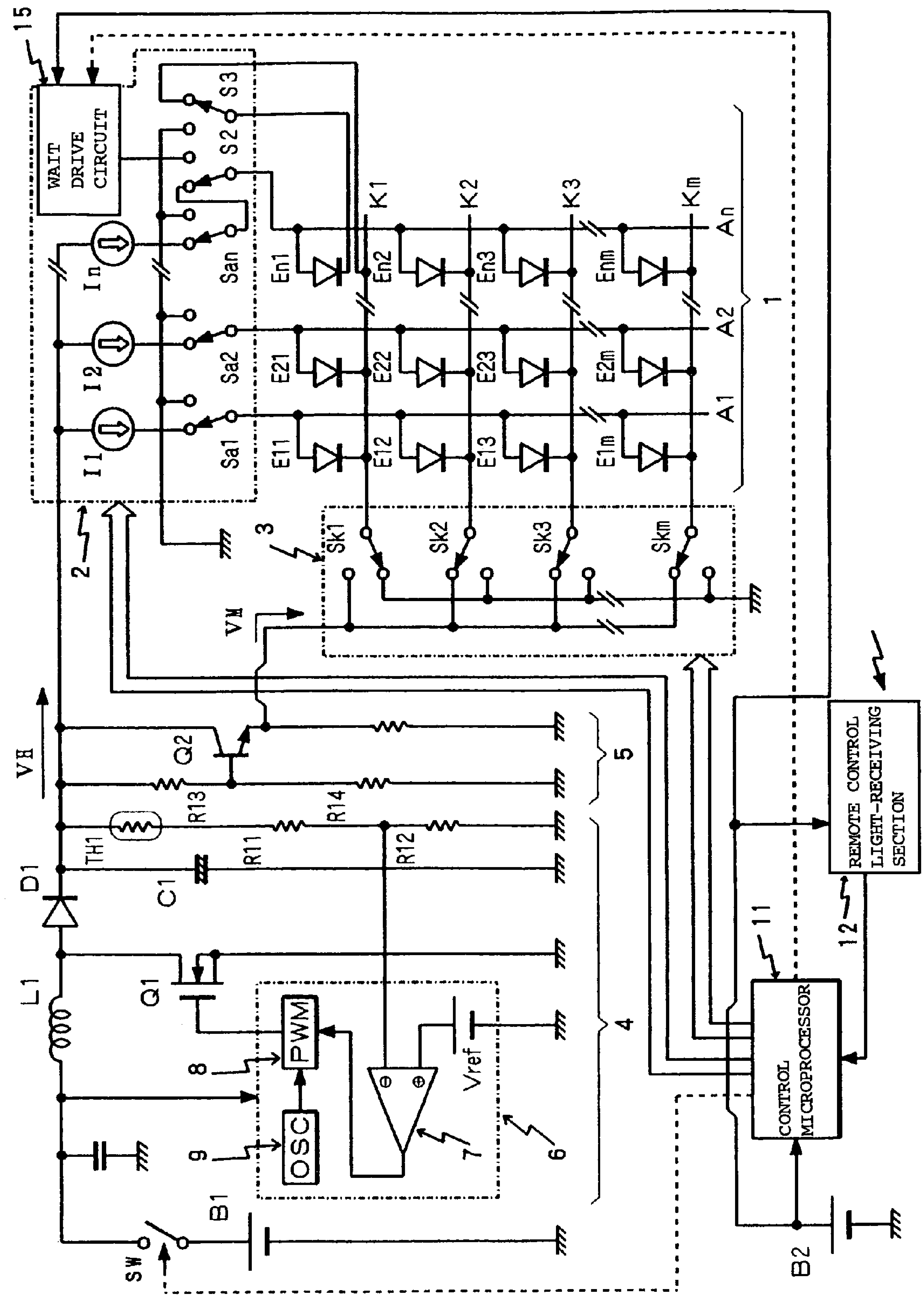
OSC
Vref
B1
B2
SW
REMOTE CONTROL LIGHT-RECEIVING SECTION
CONTROL MICROPROCESSOR

FIG.5


WAIT DRIVE CIRCUIT
REMOTE CONTROL LIGHT-RECEIVING SECTION
CONTROL MICROPROCESSOR
PWM
OSC
Vref
VH
VM
SW
B1
B2
L1
D1
Q1
Q2
C1
TH1
R11
R12
R13
R14
I1
I2
In
Sa1
Sa2
San
S2
S3
Sk1
Sk2
Sk3
Skm
K1
K2
K3
Km
A1
A2
An
E11
E12
E13
E1m
E21
E22
E23
E2m
En1
En2
En3
Enm
1
2
3
4
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6
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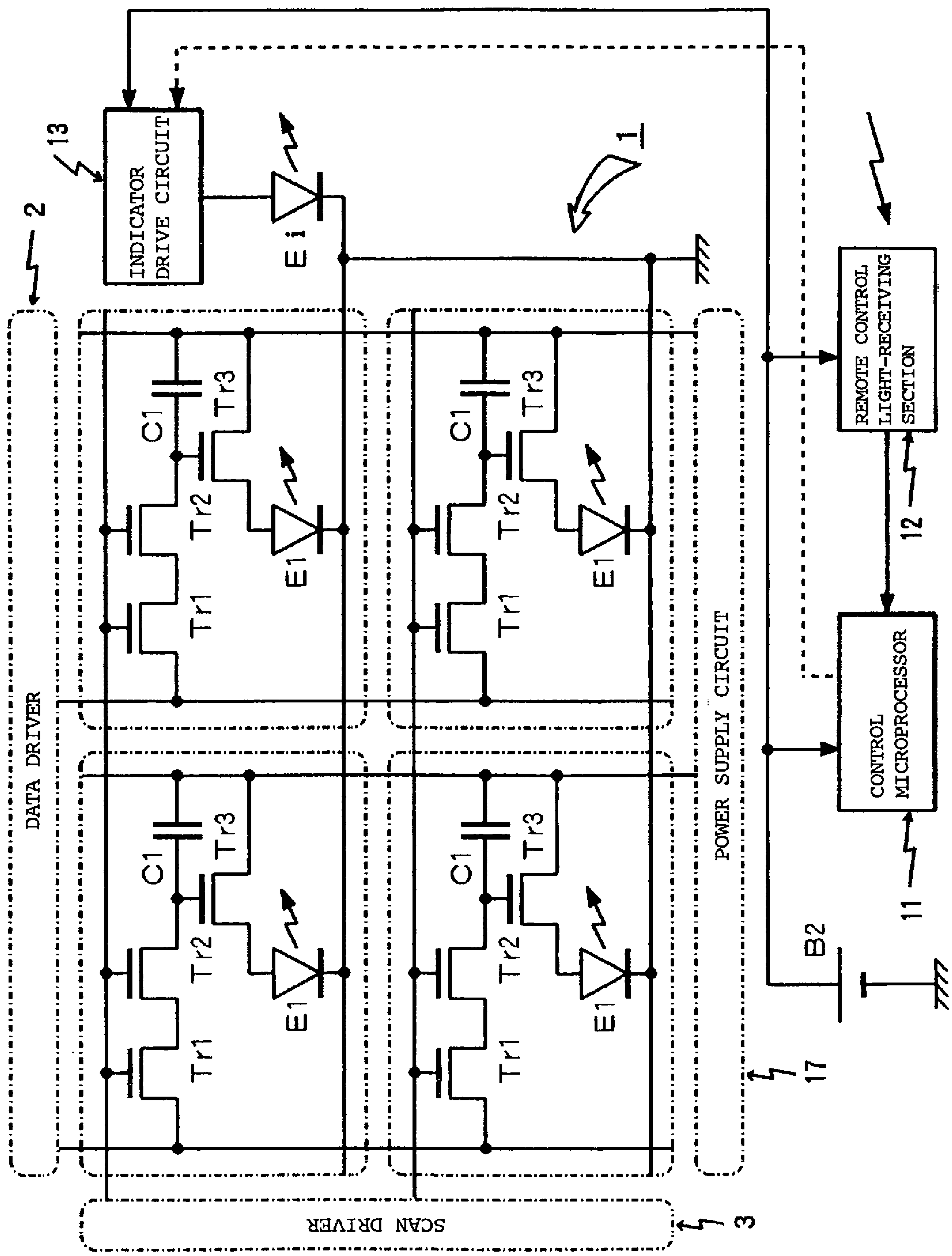
8
9
11
12
15

FIG. 6


INDICATOR DRIVE CIRCUIT
13
2
1
Ei
DATA DRIVER
C1
Tr1
Tr2
Tr3
E1
POWER SUPPLY CIRCUIT
REMOTE CONTROL LIGHT-RECEIVING SECTION
12
CONTROL MICROPROCESSOR
11
B2
17
SCAN DRIVER
3

# SELF LIGHT EMITTING DISPLAY DEVICE

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a self light emitting display device which is adopted appropriately in electrical equipment and the like that drives and allows an indicator to emit light in a wait state in which for example a main power supply is brought to an off state.

2. Description of the Related Art

For example, many of household appliances are constructed so that ON/OFF of a main power supply switch can be controlled employing an infrared type remote control device or the like. In this case, when a video reproduction equipment or the like including for example television image receiver, display, and the like is brought to a wait mode, the main power supply switch is brought to an OFF state, and supply of a drive current to main loads (video circuit, voice circuit, and the like) is stopped. Such a wait mode corresponds to a state in which an ON command from the remote control device for the main power supply switch is waited, and minimum circuits such as a remote control signal light-receiving section, a control microprocessor, and the like are in an operation state.

In electrical equipment which can choose the wait mode in which the ON command for example from the remote control device is waited as described above and a normal operation mode in which the ON command from the remote control device is received so that the main power supply switch is in an ON state, specifically an indicator for indicating the state of the wait mode during the wait mode is disposed on the front side of the equipment. For this indicator, for example, an LED, a neon tube, or the like is employed, and there are cases where the luminous color of the indicator which is illuminated during the wait mode is determined depending on a specific nation or region.

FIG. **1** shows its example by a block diagram. In FIG. **1**, reference numeral **1** designates a display panel mounted in an electrical device, and this display panel **1** is driven to be lit by a data driver **2** and a scan driver **3**. As this display panel **1**, a passive matrix type organic EL display panel can be employed as one example, and in this case, the voltage supplied from a main power supply B**1** is boosted to a drive voltage VH by a voltage boost circuit **4** and is supplied to the data driver **2**.

The drive voltage VH by the voltage boost circuit **4** is series regulated or is regulated in another way to generate a voltage VM, and this voltage VM is supplied to the scan driver **3** so that a reverse bias is given to EL elements which are brought to an non-light-emitting-state in the display panel **1**, whereby so-called cross talk light emission can be prevented.

Meanwhile, reference numeral **11** designates a control microprocessor operating by a wait power supply B**2**, and the control microprocessor **11** is constructed such that control signals can be transmitted from this control microprocessor **11** to the data driver **2** and the scan driver **3** respectively via bus lines. A remote control signal light-receiving section and an indicator drive circuit designated by reference numerals **12** and **13** are also activated by the wait power supply B**2**, and an indicator **14** for example by an LED connected to the indicator drive circuit **13** is driven to emit light in the wait mode.

While the remote control signal light-receiving section **12** is in a state in which an ON command for a main power supply switch from an unillustrated remote control device is waited in a wait mode, when the command is received, a control signal is sent from the remote control signal light-receiving section **12** to the control microprocessor **11**, and the control microprocessor **11** sets the main power supply switch SW to an ON state. Thus, the display panel **1** is brought to a normal operation mode in which a video signal can be displayed. At this time, the control microprocessor **11** sends a control signal to the indicator drive circuit **13** so that control by which the indicator **14** is extinguished is performed.

Disclosed in Japanese Patent Application Laid-Open No. 2003-219314 (for example, paragraph "0004") shown below is that in this type of electrical equipment, a green color light emission LED is driven to emit light during the wait mode, and a red color light emission LED is driven to emit light during the normal operation mode.

Meanwhile, in the above-mentioned conventional electrical equipment, the indicator constituted by an LED or the like which is driven to emit light in the wait mode is constructed so as to be in an independent circuit structure together with the indicator drive circuit which drives and allows the indicator to emit light. Accordingly, in order to construct this circuit, it cannot be avoided that the manufacturing cost inevitably increases. Consumption power by the indicator constituted by an LED or the like which is driven to emit light in the wait mode and by the indicator drive circuit which is for driving the indicator cannot be ignored, and improvement of efficiency in these circuit and the like is also required.

## SUMMARY OF THE INVENTION

The present invention has been developed as attention to the above-described technical problems has been paid, and it is an object of the present invention to provide a self light emitting display device in which for example during a wait state in which a main power supply is brought to an OFF state, an indicator which indicates this wait state as its function can be driven by low consumption power at a low cost.

A self light emitting display device according to the present invention which has been developed to solve the problems is provided with a display section by self light emitting elements, an indicator which is brought to a light emitting state during a wait time, a display section light emission drive device for driving and allowing the display section to emit light, and an indicator light emission drive device for driving and allowing the indicator to emit light, characterized in that a self light emitting element constituting the indicator and at least a part of the self light emitting elements constituting the display section are formed on a same substrate and are formed by a same manufacturing process.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram showing an example of a circuit structure of a conventional electrical equipment which drives and allows an indicator to emit light in a wait mode;

FIG. **2** is a connection diagram showing a first embodiment of a self light emitting display device including a passive matrix type display panel, according to the present invention;

FIG. **3** similarly is a connection diagram showing a second embodiment;

FIG. **4** similarly is a connection diagram showing a third embodiment;

FIG. **5** similarly is a connection diagram showing a fourth embodiment; and

FIG. **6** is a connection diagram showing a fifth embodiment of a self light emitting display device including an active matrix type display panel, according to the present invention.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

A self light emitting display device according to the present invention will be described below with reference to the embodiments shown in the drawings. In the self light emitting display device described below, described is an example in which an organic EL element in which an organic material is employed in the light emitting layer thereof is adopted as a light emitting element. This organic EL element can be electrically replaced by a structure composed of a light emitting component having a diode characteristic and a parasitic capacitance component which is connected in parallel to this light emitting component, and it can be said that the organic EL element is a capacitive light emitting element.

Regarding the organic EL element, due to reasons that the voltage-intensity characteristic thereof is unstable with respect to temperature changes while the current-intensity characteristic thereof is stable with respect to temperature changes, that when the organic EL element receives excess current, degradation of the organic EL element is considerable so that the light emission lifetime is shortened, and the like, a constant current drive is performed generally. As the display panel employing such organic EL elements, a passive matrix type display panel in which EL elements are arranged in a matrix pattern and an active matrix type display panel in which respective EL elements arranged in a matrix pattern are driven to be lit by respective TFTs (thin film transistors) have been proposed.

FIG. **2** shows a first embodiment of a self light emitting display device including a passive matrix type display panel, according to the present invention. In drive methods for organic EL elements in this passive matrix drive system, there are two methods, that is, cathode line scan/anode line drive and anode line scan/cathode line drive, and the structure shown in FIG. **2** shows a form of the former cathode line scan/anode line drive. That is, anode lines A**1**–An as n drive lines are arranged in a vertical direction (column direction), cathode lines K**1**–Km as m scan lines are arranged in a horizontal direction (row direction), and organic EL elements E**11**-Enm designated by symbols/marks of diodes are formed at portions at which the anode lines intersect the cathode lines (in total, n×m portions) to construct a display panel **1** as a display section.

In the embodiment shown in this FIG. **2**, an organic EL element which functions as an indicator Ei which is brought to a light emission state during a later-described wait mode is also formed on the same substrate constituting the display panel **1**. Although the indicator Ei is shown as if it were constituted by one EL element for convenience of illustration, preferably, the indicator is formed of an assembly of several to several-tens EL elements of the degree by which this state can be obviously displayed during the later-described wait mode.

The organic EL elements E**11**–Enm constituting the display section and organic EL elements constituting the indicator Ei are formed by the same manufacturing processes on the same substrate as described below. That is, the above-mentioned anode lines are formed on a transparent substrate (for example, a glass substrate) in a stripe pattern, utilizing a photolithographic method or the like. Well-known ITO (Indium Tin Oxide) is employed as these anode lines, and a film of the same ITO is formed as anode electrodes of the EL elements over an area in which the pixels by the respective EL elements are formed.

Subsequently, a film of an insulating layer for which for example high molecular weight polyimide or the like is employed as a material is formed on the entire surface except for the area on which the respective pixels are formed, and then scan line partition walls are formed in a stripe pattern in a direction perpendicular to the anode lines. After these scan line partition walls are formed, a film of an organic EL material is formed over the entire surface including the area on which the pixels by the above-mentioned ITO are formed. Then, a metal thin film made of an aluminum material or the like constituting the cathodes is formed for example by resistance heating deposition method.

Although this metal thin film is also formed over the entire surface, this metal thin film is electrically separated in the direction of the thickness of the surface by the existence of the scan line partition walls formed in the stripe pattern. As a result, the metal thin film functions as the cathode side electrodes of the pixels formed by film formation of the organic EL material, and is formed as the cathode lines which are mutually insulated by the scan line partition walls.

As a result, in the respective EL elements E**11**–Enm constituting the pixels, one ends thereof (anode terminals in equivalent diodes of EL elements) are connected to the anode lines and the other ends thereof (cathode terminals in the equivalent diodes of EL elements) are connected to the cathode lines, corresponding to respective intersection positions between the anode lines A**1**–An extending along the vertical direction and the cathode lines K**1**–Km extending along the horizontal direction, as shown in FIG. **2**.

The respective anode lines A**1**–An in the display panel **1** formed by the above-described manufacturing processes are connected to an anode line drive circuit **2** provided as a data driver constituting a display section light emission drive device, and the respective cathode lines K**1**–Km are connected to a cathode line scan circuit **3** provided as a scan driver which similarly constitutes the display section light emission drive device, so that the respective anode and cathode lines A**1**–An and K**1**–Km are driven thereby.

The anode line drive circuit **2** is provided with constant current sources I**1**–In which are activated utilizing a drive voltage VH supplied from a voltage boost circuit **4** in a later-described DC-DC converter and drive switches Sa**1**-San, and the drive switches Sa**1**-San are connected to the constant current sources I**1**–In side so that current from the constant current sources I**1**–In is supplied to the respective EL elements E**11**–Enm arranged corresponding to the cathode lines. Further, in this embodiment, when the current from the constant current sources I**1**–In is not supplied to the respective EL elements, the drive switches Sa**1**–San can allow the respective anode lines to be connected to a ground side provided as a reference potential point.

The cathode line scan circuit **3** is equipped with scan switches Sk**1**–Skm corresponding to the respective cathode lines K**1**–Km, and these scan switches operate to allow either a reverse bias voltage VM provided from a later-described reverse bias voltage generation circuit **5** for mainly preventing cross talk light emission or the ground potential provided as the reference potential point to be connected to corresponding cathode lines. Thus, the constant current sources I**1**–In are connected to desired anode lines

A1–An while the cathode lines are set at the reference potential point (ground potential) at predetermined cycles, so that the respective EL elements can be selectively illuminated.

Meanwhile, the DC-DC converter is constructed to utilize PWM (pulse width modulation) control as the voltage boost circuit **4** and to generate the drive voltage VH of direct current in the example shown in FIG. **2**. This DC-DC converter also can utilize well-known PFM (pulse frequency modulation) control or PSM (pulse skip modulation) control instead of the PWM control.

This DC-DC converter is constructed such that PWM wave outputted from a switching regulator **6** constituting a part of the voltage boost circuit **4** gives ON control to a MOS type power FET Q**1** provided as a switching element at a predefined duty cycle. That is, by ON operation of the power FET Q**1**, electrical energy from the main power supply B**1** constituting the primary side is accumulated in an inductor L**1**, and the electrical energy accumulated in the inductor L**1** accompanied by OFF operation of the power FET Q**1** is accumulated in a capacitor C**1** via a diode D**1**. By repeats of ON and OFF operations of the power FET Q**1**, a boosted DC output can be obtained as a terminal voltage of the capacitor C**1**.

The DC output voltage is divided by a thermistor TH**1** performing temperature compensation and resistances R**11** and R**12**, is supplied to an error amplifier **7** in the switching regulator **6**, and is compared to a reference voltage Vref in this error amplifier **7**. This comparison output (error output) is supplied to the PWM circuit **8**, and by controlling the duty of a signal wave provided from an oscillator **9**, the output voltage is feedback controlled so as to be maintained at a predetermined drive voltage VH. Therefore, the output voltage by the DC-DC converter, that is, the drive voltage VH, can be shown as the following Equation 1:

$$VH = V\text{ref} \times [(TH\mathbf{1} + R\mathbf{11} + R\mathbf{12})/R\mathbf{12}] \quad \text{(Equation 1)}$$

Meanwhile, the reverse bias voltage generation circuit **5** utilized for preventing the cross talk light emission is constructed by a voltage divider circuit dividing the drive voltage VH. That is, this voltage divider circuit is composed of resistances R**13** and R**14** and an npn transistor Q**2** functioning as an emitter follower, so that the reverse bias voltage VM is obtained at the emitter of the transistor Q**2**. Therefore, where the base-emitter voltage of the transistor Q**2** is denoted by Vbe, the reverse bias voltage VM obtained by the voltage divider circuit can be shown as the following Equation 2:

$$VM = VH \times [R\mathbf{14}/(R\mathbf{13} + R\mathbf{14})] - Vbe \quad \text{(Equation 2)}$$

Control buses are connected from a control microprocessor **11** including a CPU to the anode line drive circuit **2** and the cathode line scan circuit **3**. Based on a video signal to be displayed, the scan switches Sk**1**–Skm and the drive switches Sa**1**–San are operated. Thus, while the cathode scan lines are set at the ground potential at predetermined cycles based on the video signal, the constant current sources I**1**–In are connected to desired anode lines. Accordingly, the respective light emitting elements selectively emit light, and an image based on the video signal is displayed on the display panel **1**.

The first cathode line K**1** is set to the ground potential so that the state shown in FIG. **2** is brought to a scan state, and at this time the reverse bias voltage VM from the reverse bias voltage generation circuit **5** is applied to the cathode lines K**2**–Km of a non-scan state. Accordingly, respective EL elements connected to intersection points between driven anode lines and cathode lines which are not selected for scanning are prevented from emitting cross talk light.

In the embodiment shown in FIG. **2**, the control microprocessor **11** is activated by a wait power supply B**2**, and a remote control signal light-receiving section designated by reference numeral **12** is also activated by the wait power supply B**2**. In the state of the wait mode shown in FIG. **2**, the remote control signal light-receiving section **12** is brought to the wait mode in which an ON command for a main power supply switch from an unillustrated remote control device is waited.

When the remote control signal light-receiving section **12** receives the command, a control signal is sent from the remote control signal light-receiving section **12** to the control microprocessor **11**, and the control microprocessor **11** allows a switch SW of the main power supply B**1** to be in an ON state via a system ON/OFF port which is shown by a broken line. Thus, driving power is supplied to the anode line drive circuit **2** and the cathode line scan circuit **3** which function as the display section light emission drive device, and the display panel **1** is brought to a normal operation mode in which the video signal can be displayed.

Meanwhile, a command signal can be supplied from the control microprocessor **11** to an indicator light emission drive device, that is, an indicator drive circuit **13** formed in the anode line drive circuit **2** via a control port shown by a broken line. This indicator drive circuit **13** is activated by the wait power supply B**2**, and in the wait mode, a drive current is supplied to the EL elements which function as the indicator Ei formed in the display panel **1** to control the indicator Ei so that the indicator Ei is in a light emission state. When the indicator drive circuit **13** is brought to the normal operation mode, the indicator Ei is extinguished.

In the embodiment shown in FIG. **2**, the indicator drive circuit **13** is formed in the anode line drive circuit **2**. In this case, since the constant current sources I**1**–In, the drive switches Sa**1**–San, and the like in the anode line drive circuit **2** can be constructed by one chip IC, and since even the indicator drive circuit **13** can be constructed mainly by an analog switch, they can be made in the substrate of the one chip IC by the same manufacturing processes. In short, in this embodiment, the indicator drive circuit **13** is formed as a part of the anode line drive circuit **2** as one chip IC.

There is a case where this one chip IC constituting the anode line drive circuit **2** and the indicator drive circuit **13** is formed on a so-called silicon substrate which is independent of the display panel **1**, and this one chip IC may also be formed for example on a glass substrate used in common with the display panel **1**. In the structure shown in FIG. **2**, although the cathode electrode of the EL element which functions as the indicator Ei is connected to a ground line in the anode line drive circuit **2**, this cathode electrode may be connected for example to a ground line in the cathode line scan circuit **3**.

With the embodiment shown in FIG. **2**, since the indicator drive circuit **13** can be formed for example as one chip IC in the anode line drive circuit **2**, the manufacturing cost can be reduced compared to the case where an indicator drive circuit is prepared separately. Further, the EL element which functions as the indicator Ei can also be formed through the same process on the same substrate as that of the respective EL elements E**11**–Enm constituting the display section, thereby contributing to cost reduction. Moreover, by constituting the light emitting element which functions as the indicator Ei by an organic EL element as in the embodiment shown in FIG. **2**, high light emission efficiency that the organic EL element has can be produced as it is. Therefore, the function of the indicator which informs of the wait state can be realized with low consumption power.

FIG. **3** shows a second embodiment of a self light emitting display device including a passive matrix type display panel, according to the present invention. In the embodiment shown in this FIG. **3**, the indicator drive circuit **13** is constituted by an IC chip which differs from that of the anode line drive circuit **2** so as to be constructed such that the indicator drive circuit **13** can be operated independently of the anode line drive circuit, and other structures are the same as those of the embodiment shown in FIG. **2**. Therefore, the same functional parts are designated by the same reference numerals or characters, and explanation thereof will be omitted.

In the embodiment shown in this FIG. **3**, the EL element which functions as the indicator Ei can be formed by the same processes on the same substrate as that of the respective EL elements E**11**–Enm constituting the display section, thereby contributing to cost reduction. By constituting the light emitting element functioning as the indicator Ei by the organic EL element, the function of the indicator which informs of the wait state can be realized with low consumption power.

FIG. **4** shows a third embodiment of a self light emitting display device including a passive matrix type display panel, according to the present invention. In the embodiment shown in this FIG. **3**, the EL element constituting the indicator is used both as the indicator and a part of the EL elements constituting the display section. In the embodiment shown in this FIG. **4** also, its basic structure is the same as that of the embodiment shown in FIG. **2**, therefore the same functional parts are designated by the same reference numerals or characters, and explanation thereof will be omitted.

In the embodiment shown in FIG. **4**, En**1** that is a display EL element arranged in the display panel **1** is constructed so as to be utilized as an EL element constituting the indicator. Although the structure shown in FIG. **4** is illustrated such that only the EL element En**1** is used both as the indicator and the display EL element, preferably, this is constituted by an assembly of several to several-tens EL elements of the degree by which they can be displayed as the indicator.

In order to use display EL elements both as the indicator and the display EL elements, a switch S**1** for driving and allowing the indicator to emit light is provided in addition to the drive switches Sa**1**–San in the anode line drive circuit **2**. The drive switches Sa**1**–San and the indicator light emission drive switch S**1** shown in FIG. **4** show a state in which the normal operation mode is selected, that is, a state in which the display panel **1** is driven to emit light.

In this structure, in the case of the wait mode, the drive switch San is switched to the side of a wait drive circuit **15** which functions as the indicator light emission drive device, and the indicator light emission drive switch S**1** is switched to a state opposite to that shown in the drawing. Therefore, the drive current outputted from the wait drive circuit **15** during the wait mode flows tracing a path through the drive switch San, the EL element En**1** functioning as the indicator, the indicator light emission drive switch S**1**, and to the ground provided as the reference potential point, and the EL element En**1** is allowed to emit light. Therefore, in the embodiment shown in this FIG. **4** also, operations and effects similar to those of the embodiment shown in FIG. **2** can be obtained.

FIG. **5** shows a fourth embodiment of a self light emitting display device including a passive matrix type display panel, according to the present invention. In the embodiment shown in this FIG. **5**, En**1** that is a display EL element arranged in the display panel **1** is constructed so as to be utilized as an EL element constituting the indicator, similarly to the embodiment shown in FIG. **4**. In the embodiment shown in this FIG. **5** also, its basic structure is the same as that of the embodiment shown in FIG. **2**, therefore the same functional parts are designated by the same reference numerals or characters, and explanation thereof will be omitted.

With the embodiment shown in this FIG. **5**, in order to use a display EL element both as the indicator and a display EL element, switches S**2**, S**3** for driving and allowing the indicator to emit light are provided in addition to the drive switches Sa**1**–San in the anode line drive circuit **2**. The drive switches Sa**1**–San and the indicator light emission drive switches S**2**, S**3** shown in FIG. **5** show a state in which the normal operation mode is selected, that is, a state in which the display panel **1** is driven to emit light.

In this structure, in the case of the wait mode, the indicator light emission drive switches S**2**, S**3** are switched to a state opposite to that shown in the drawing. Therefore, the drive current outputted from the wait drive circuit **15** during the wait mode flows tracing a path through the switch S**2**, the EL element En**1** functioning as the indicator, the switch S**3**, and to the ground provided as the reference potential point, and the EL element En**1** is allowed to emit light.

Therefore, in the embodiment shown in this FIG. **5** also, operations and effects similar to those of the embodiment shown in FIG. **2** can be obtained. In the embodiment shown in this FIG. **5**, although there is a need to dispose the indicator light emission drive switches S**2**, S**3**, the drive switch San need not specifically be a three-terminal select switch as shown in FIG. **4**, whereby the structure can be simplified.

FIG. **6** shows a fifth embodiment of a self light emitting display device including an active matrix type display panel, according to the present invention. In a display panel **1** constituting a display section in the embodiment shown in this FIG. **6**, a large number of data electrode lines to which respective data signals corresponding to video data provided from the data driver **2** are supplied are arranged in the column direction, and a large number of electrical power supply lines which supply operational power supply provided from a power supply circuit **17** to respective pixels are arranged in parallel with the data electrode lines. Meanwhile, a large number of scan electrode lines to which a scan signal provided from the scan driver **3** is supplied are arranged in the row direction, and a large number of ground lines that are at the reference potential point are also arranged in parallel with the scan electrode lines.

In a circuit structure including EL element E**1** which corresponds to a unit light emitting pixel, control TFTs, a drive TFT, and a capacitor are provided. In the form shown in FIG. **6**, first and second transistors Tr**1**, Tr**2** are employed as the control TFTs, and the scan signal for scanning lines is sequentially given from the scan driver **3** to respective gates thereof via the scan electrode lines.

In this embodiment, sources and drains of the first and second control transistors Tr**1**, Tr**2** are connected in series. The source of the first control transistor Tr**1** is connected to the data electrode lines, and the drain of the second control transistor Tr**2** is connected to the gate of the drive transistor Tr**3** and to one terminal of the capacitor C**1**.

The other terminal of the capacitor C**1** and the source of the drive transistor Tr**3** are connected to the power supply line, and the drain of the drive transistor Tr**3** is connected to the anode terminal of the EL element E**1**. The cathode terminal of the EL element E**1** is connected to the ground line. Although a structure corresponding to four pixels are illustrated for convenience of illustration in FIG. **6**, the above-described pixel structure are respectively constructed similarly, corresponding to the respective organic EL elements E**1** arranged in the display panel **1**.

In light emission control operations of a unit pixel of the display panel **1** in which such circuits are arranged in the row and column directions, an ON voltage is supplied from the scan driver **3** to the gates of the first and second control transistors Tr**1**, Tr**2** via the scan electrode lines during the address period. In the meantime, a data signal corresponding to video data is supplied from the data driver **2** to the sources of the control transistors Tr**1** of the scan state via the data electrode lines.

Thus, current corresponding to the video data signal is allowed to flow in the capacitors C**1** via the respective sources and drains of the transistors Tr**1**, Tr**2** which are connected in series, and by this the capacitors C**1** are charged. The charge voltage thereof is supplied to the gate of the drive transistor Tr**3**, and the transistor Tr**3** allows current corresponding to the gate voltage thereof to flow in the organic EL element E**1**, whereby the EL element E**1** emits light.

When the gate voltage of the control transistors Tr**1**, Tr**2** becomes an OFF voltage, the transistors Tr**1**, Tr**2** become so-called cutoff. However, the gate voltage of the drive transistor Tr**3** is maintained by electrical charges accumulated in the capacitor C**1**. The drive current to the organic EL element E**1** by the drive transistor Tr**3** is maintained until a next addressing time, whereby light emission of the EL element E**1** is also maintained.

In the light emitting display panel **1** shown in FIG. **6**, in addition to the TFTs and the EL elements constituting respective pixels as the display section, an organic EL element functioning as the indicator Ei is also formed on the same substrate constituting the display panel **1**. Although the indicator Ei is shown as if it were constituted by one EL element for convenience of illustration, preferably, the indicator is formed of an assembly of several to several-tens EL elements of the degree by which this state can be obviously displayed during the wait mode.

The respective EL elements E**1** constituting the display section and the EL element constituting the indicator Ei are formed by the same manufacturing processes for example on a glass substrate. Summary of this manufacturing processes is the same as that described in the explanation of the embodiment shown in FIG. **2**.

Meanwhile, the EL element constituting the indicator Ei is constructed so as to be driven to emit light by the drive current supplied by the indicator light emission drive device, that is, the indicator drive circuit **13** during the wait mode. The indicator drive circuit **13** is constructed so as to be activated by the wait power supply B**2**, together with the control microprocessor **11** and the remote control signal light-receiving section **12**, and these respective functions and operations are the same as those described with reference to FIG. **2**.

Although not shown in FIG. **6**, the control microprocessor **11** allows the main power supply switch SW to be in the OFF state during the wait mode, and the main power supply switch SW is brought to the ON state during the normal operation mode so that the data driver **2**, the scan driver **3**, and the power supply circuit **17** are brought to the operation state as described with reference to FIG. **2**.

With the embodiment shown in FIG. **6**, the EL elements functioning as the indicator Ei can be formed on the same substrate as that of the respective EL elements E**1** constituting the display section by the same processes, and therefore the manufacturing cost can be reduced compared to the structure of a conventional indicator employing an LED and the like.

Although the indicator drive circuit **13** is shown in a state in which the circuit **13** is constituted by an IC chip which is different from that of the data driver **2** in the embodiment shown in FIG. **6**, this indicator drive circuit **13** can be formed as one chip IC for example in the data driver **2** as described with reference to FIG. **2**. In this case, it becomes possible to reduce the manufacturing cost, compared to the case where the indicator drive circuit is prepared separately.

In the embodiments described above, although the examples are shown which respectively utilize organic EL elements as self light emitting elements that constitute display pixels and self light emitting elements that constitute the indicator, of course, self light emitting type elements other than organic EL elements can be utilized as the self light emitting elements.

What is claimed is:

**1**. A self light emitting display device provided with a display section by self light emitting elements, an indicator which is brought to a light emitting state during a wait time, a display section light emission drive device for driving and allowing the display section to emit light, and an indicator light emission drive device for driving and allowing the indicator to emit light, characterized in that a self light emitting element constituting the indicator and at least a part of the self light emitting elements constituting the display section are formed on a same substrate.

**2**. The self light emitting display device according to claim **1**, characterized in that the self light emitting element constituting the indicator is used both as the indicator and a part of the light emitting elements constituting the display section.

**3**. The self light emitting display device according to claim **1**, characterized in that the indicator light emission drive device is formed on a same substrate as that of the display section light emission drive device by a same manufacturing process.

**4**. The self light emitting display device according to claim **2**, characterized in that the indicator light emission drive device is formed on a same substrate as that of the display section light emission drive device by a same manufacturing process.

**5**. The self light emitting display device according to any one of claims **1** to **4**, characterized in that the indicator light emission drive device is constructed so as to operated independently of the display section light emission drive device.

**6**. The self light emitting display device according to claim **1** or **2**, characterized in that the indicator light emission drive device is constituted by a part of the display section light emission drive device.

**7**. The self light emitting display device according to any one of claims **1** to **4**, characterized in that the indicator and at least a part of self light emitting elements constituting the display section are constituted by organic EL elements in which an organic compound is employed in a light emitting layer.

**8**. The self light emitting display device according to claim **5**, characterized in that the indicator and at least a part of self light emitting elements constituting the display section are constituted by organic EL elements in which an organic compound is employed in a light emitting layer.

**9**. The self light emitting display device according to claim **6**, characterized in that the indicator and at least a part of self light emitting elements constituting the display section are constituted by organic EL elements in which an organic compound is employed in a light emitting layer.

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